1. A town has an initial population of 70000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	70020	70040	70060	70080	70100	70120	70140	70160	70180

   A. Non-Linear Power

   B. Logarithmic

   C. Exponential

   D. Linear

   E. None of the above

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2. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 771 grams of element X and after 5 years there is 77 grams remaining.

   A. About 730 days

   B. About 365 days

   C. About 1 day

   D. About 2190 days

   E. None of the above

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3. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's

temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 200° *C and is placed into a* 18° *C bath to cool. After 25 minutes, the uranium has cooled to* 150° *C.*

A. $k = -0.03101$

B. $k = -0.03148$

C. $k = -0.01285$

D. $k = -0.01662$

E. None of the above

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4. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

   Uranium is taken out of the reactor with a temperature of 200° *C and is placed into a* 17° *C bath to cool. After 13 minutes, the uranium has cooled to* 156° *C.*

   A. $k = -0.06027$

   B. $k = -0.06113$

   C. $k = -0.02799$

   D. $k = -0.09902$

   E. None of the above

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5. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 741 grams of element X and after 7 years there is 82 grams remaining.

A. About 1095 days

B. About 3285 days

C. About 730 days

D. About 1 day

E. None of the above

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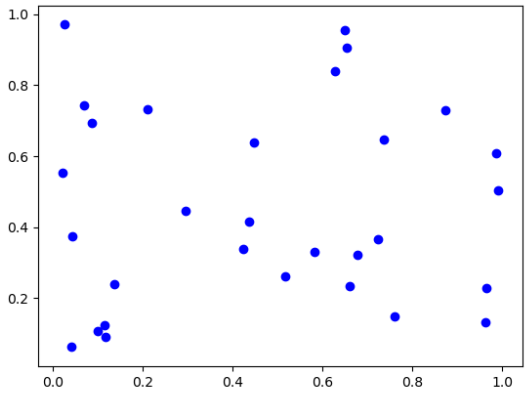
6. Determine the appropriate model for the graph of points below.



A. Linear model

B. Non-linear Power model

C. Exponential model

D. Logarithmic model

E. None of the above

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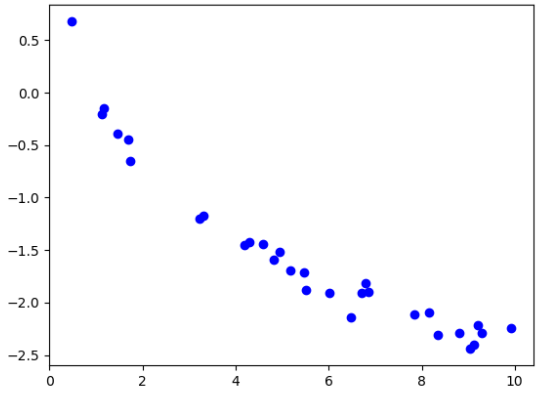
7. Determine the appropriate model for the graph of points below.



A. Linear model

B. Exponential model

C. Logarithmic model

D. Non-linear Power model

E. None of the above

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8. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 1 hours, the petri dish has 19 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 264 minutes

   B. About 209 minutes

   C. About 44 minutes

   D. About 34 minutes

   E. None of the above

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9. A town has an initial population of 70000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	69950	69900	69850	69800	69750	69700	69650	69600	69550

A. Exponential

B. Linear

C. Non-Linear Power

D. Logarithmic

E. None of the above

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10. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 3 hours, the petri dish has 64 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 57 minutes

B. About 77 minutes

C. About 342 minutes

D. About 465 minutes

E. None of the above
